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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/256,643 02/23/99 FORBES

L 303.324US2

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MM92/0705

EXAMINER

TRINH, M

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 07/05/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/256,643	FORBES ET AL.	
	Examiner	Art Unit	
	Michael M. Trinh	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

- 1) Responsive to communication(s) filed on 17 April 2000.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 21-33 and 36-75 is/are pending in the application.
 - 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 21-33 and 36-75 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) The proposed drawing correction filed on _____ is: a) approved b) disapproved.
- 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
 - a) All b) Some * c) None of the CERTIFIED copies of the priority documents have been:
 1. received.
 2. received in Application No. (Series Code / Serial Number) _____ .
 3. received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

15) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	18) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____
16) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	19) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
17) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>2-4-6,7</u> .	20) <input type="checkbox"/> Other: _____

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DETAILED ACTION

*** Amendment filed April 17, 2000 has been entered as paper number 10, in which claims 34-35 were canceled, and in which claims 36-75 have been newly added.

Election/Restrictions

1. Claims 34-35 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Election filed April 17, 2000 was made without traverse in Paper No. 10.

** Non-elected claims 34-35 were also canceled by Applicant.

Claim Rejections - 35 USC § 112

2. Claims 43-75 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. "Selecting x at a predetermined value approximately between 0 and 1.0" is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure, and in which x is not equal 0 or 1.0. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976)..

Accordingly, "selecting x at a predetermined value approximately between 0 and 1.0" should be included in base claims 43,50,55,60,65,68, and 73.

3. Claims 22,25,27,32, 45,52,57,60-75 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 22,25, 27: meaning and scope of "desired value", "predetermined value" and "desired range" are unclear and indefinite. What energy, retention time and photo wavelength are "desired" and "predetermined"? It reads on a nebulous step conducted prior to the manipulative steps of the claimed invention, hence rendering the present process claim being unclear in meaning and scope. Moreover, "predetermined" or "desired" according to applicant's own definition merely means determined beforehand, hence rendering the process claim being indefinite.

Re claim 27, meaning of "most likely" is indefinite for how it is most likely.

Re claim 32, as shown in figures 12F,12G, the “gate” is oxidized to form a thin layer of oxide. Thus, “gate material” at line 1 and line 2 is incorrect, and should be “gate”.

Re claims 45,52,57,62,67, it is unclear and indefinite to determine what is “an approximate barrier energy”, and its meaning and scope.

Re claims 60-64 and 68-72; claims 65-67 and 73-75: For example, between base claim 60 and 68, the claimed processing steps of base claim 60 and base claim 68 are *identical*. The only difference is in the preambles of claims 60 and 68. However, first, although claim 60 does not expressly mention “memory cell”, the floating gate transistor is a form of memory cell. Second, although preamble of claim 68 recites “memory cell”, it is still considered as a floating gate transistor since no additional limitation to make claim 68 being a “memory cell”. Meaning and scope of the claims are unclear and indefinite. Similar discussion is to base claim 65 and 73, and other respective dependent claims.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

- (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
- (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

5. Claims 21-33,36-75 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Forbes et al (5,886,368).

Forbes teaches a method for forming a transistor comprising at least the steps of: forming a source region 102 and drain region 104 in a semiconductor substrate 108 (Figs 12F, 12A-12G; cols 13-15,10-12), a channel region being between the source and drain regions; forming an

insulating layer 1118 on the channel region; forming a floating gate 106 of silicon carbide compound $\text{Si}_{1-x}\text{C}_x$ (col 7, lines 50-65) on the insulating layer, wherein x is selected at a value approximately between 0 and 1.0; doping the silicon carbide with dopant; and forming an intergate dielectric thereon; and forming a control gate 114 over the floating gate 106. Other additional limitations including deposition techniques would have been obvious and known to one of ordinary skill in the art.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 21-33,36-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al (5,449,941) taken with Halvis et al (5,369,040).

Yamazaki et al teaches a method for forming a MOS transistor for memory cell (Figs 1A-1D; col 4, lines 12-15; lines 27-60; col 3, lines 66-68) comprising: forming a source region and drain region in a semiconductor silicon substrate 101 (Fig 1D; col 4, lines 23-26), wherein a channel region being between the source and drain regions; forming an insulating layer 106 on the channel region; forming a floating gate 107 by patterning and etching a layer of gate material; forming a intergate dielectric layer 108; and forming a control gate 109 over the floating gate.

Yamazaki lack to form the floating gate of silicon carbide compound.

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However, *Halvis et al* teach (at col 4, lines 10-15; cols 3-4), rather using polysilicon gate, using silicon carbide compound $\text{Si}_{1-x}\text{C}_x$, wherein x is selected at a value approximately between 0 and 0.5. for forming a gate on the gate insulating layer.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the polysilicon gate of Yamazaki with the floating gate of silicon carbide compound $\text{Si}_{1-x}\text{C}_x$, wherein x is selected at a value approximately between 0 and 0.5 as taught by *Halvis et al*. This is because of the desirability to improve response, to improve quantum efficiency, and to improve performance and light sensitivity. Regarding other limitations including deposition techniques, for example, in claim 40, it would have been obvious to one of ordinary skill in the art to use any available and well known deposition techniques to deposit a silicon carbide compound on the gate insulating layer because these deposition techniques have been proven in the art to be able to effectively form a reliable and excellent layer. Forming an oxide by dry plasma oxidation would have been obvious and well known to skill artisan because of the desirability to obtain a high quality and low defect oxide. Implanting dopant into the gate would have been obvious and well known to one of ordinary skill in the art because of the desirability to control conductivity of the gate.

The "person having ordinary skill" in this art has the capability of understanding the scientific and engineering principles applicable to the claimed invention. The evidence of record including the references and/or the admissions are considered to reasonably reflect this level of skill. The selection of x value would have been obvious, involve routine optimization which has been held to be within the level of ordinary skill in the art, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948) and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (703) 308-2554. The examiner can normally be reached on M-F from 8:30 Am to 4:30 Pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Whitehead Jr Carl can be reached on (703) 308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

Oasc



Michael Trinh
Primary Examiner